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# bart impact program

# ENVIRONMENTAL IMPACTS OF BART THE USER'S EXPERIENCE

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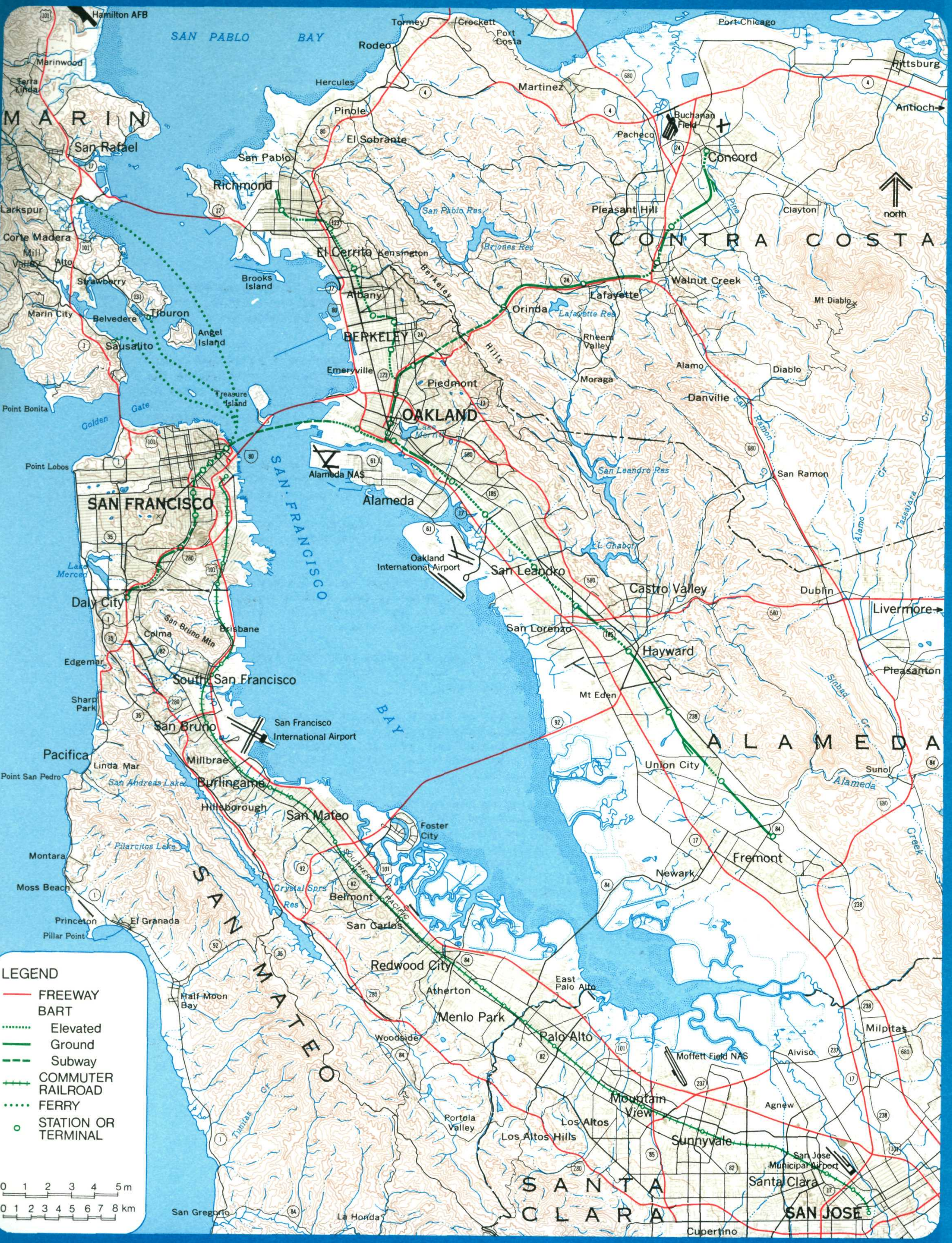
TS DEPARTMENT
AUG 29 1978
UNIVERSITY OF CALIFORNIA

technical memorandum



# SAN FRANCISCO BAY REGION
## CENTRAL AREA

MTC Metropolitan Transportation Commission

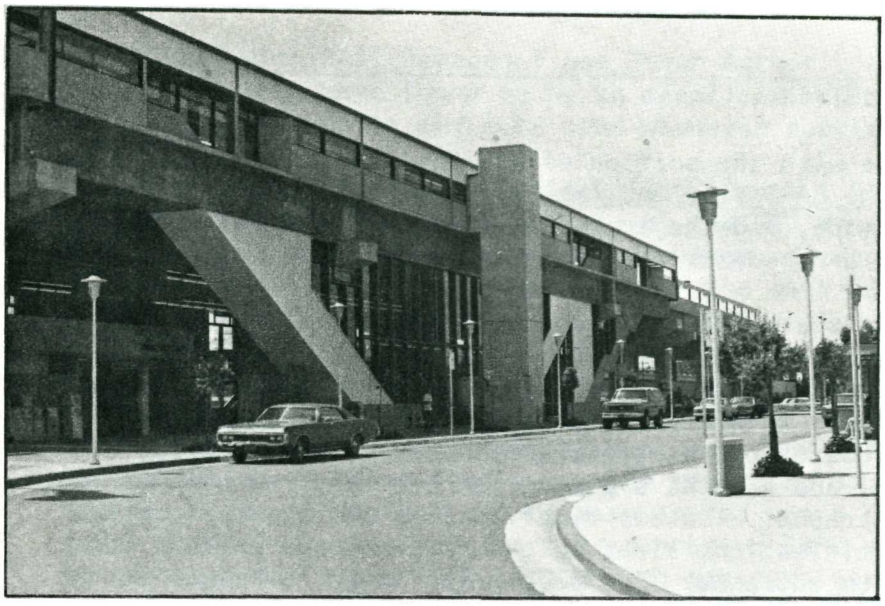


PHOTO 2.1

ABOVE GROUND
BART STATION
(SAN LEANDRO)

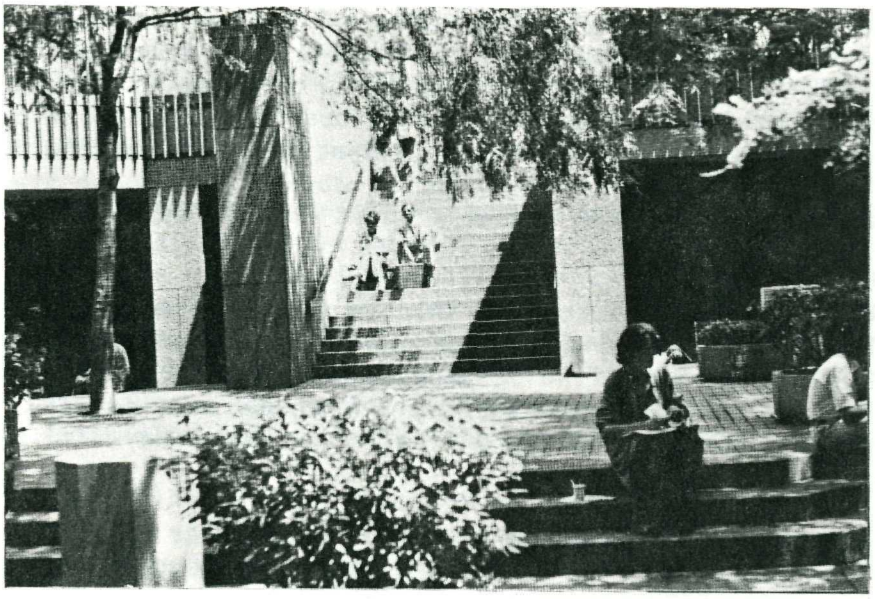


PHOTO 2.2

BART STATION
PLAZA
(MONTGOMERY)

- Signing does not direct the driver, i.e., uncertainty whether entrance or exit, kiss-and-ride; or park-and-ride.
- Internal circulation is circuitous, i.e., structural intrusions require navigation through a maze.
- Some key roadways are one-way when they should be two-way. This results in many wrong way movements.
- A driveway at the rear of the lot is too narrow, i.e., it constricts traffic flow and is hazardous.
- Many traffic control signs are nonstandard and poorly placed, thereby confusing auto drivers.

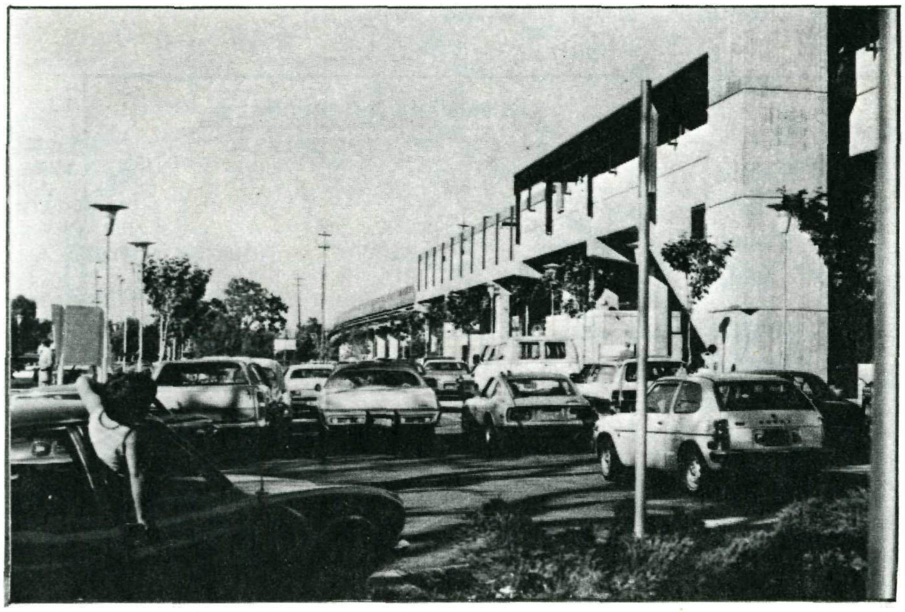


PHOTO 2.3
PARKING LOT CONGESTION
(PLEASANT HILL)

The Bay Fair station area contains a unique, curved underpass between two parking lots, where blocked view of oncoming traffic has contributed to several accidents. Circulation at the Daly City station lot requires a 90° turn into a narrow driveway immediately after entering the lot from the street. In each case, drivers are required to negotiate unexpected or atypical movements without adequate signing.

Despite the often confusing parking lot circulation systems, vehicle accidents within the parking lots do not appear to be a particular problem.

signing within the lot is often confusing and inconsistent. Three different types of signs identify these special spaces. The sign saying "RESTRICTED PARKING" seems to discourage drivers from using the spaces. Sometimes commuters park in the midday spaces. Time limits are only occasionally enforced. It was originally assumed by BART that control could be provided to keep the spaces free of commuters. One BART official believes that many stations have too many designated midday spaces (e.g., Pleasant Hill, North Berkeley, El Cerrito del Norte).

## How well do designated kiss-and-ride drop-off areas function?

Autos dropping off patrons during peak periods are supposed to stop in either kiss-and-ride or midday parking areas, usually located away from main entrances. However, most persons are dropped off in front of station entrances, which is legal only at Pleasant Hill and Rockridge stations, thus blocking drop-offs by buses, taxis, etc. and underutilizing intended kiss-and-ride drop-off locations.

## What does the auto user experience on the path from parking lot to station?

Persons walking to the station entrances after parking their cars will find well-marked sidewalks and crosswalks. The visibility of station entrances from the lots is generally good.

At two-thirds of the suburban stations, parking lot users must cross a loop road which buses use to pull in front of the station entrance. Larger lots generate more pedestrian conflicts with loop road traffic. The problem is compounded when parking lot users cross the loop road at random locations rather than at established crosswalks as shown in Photo 2.4. A pedestrian overpass is presently being built between the parking structure and station to correct the existing problem at the Daly City Station. Few parking lot accidents involving pedestrians have been reported, however, despite these potential dangers.

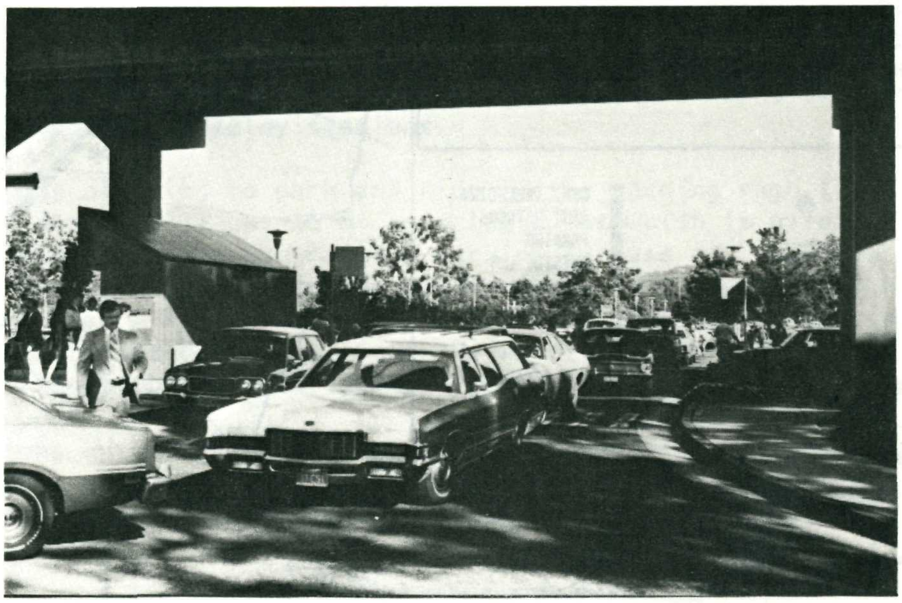


PHOTO 2.4

CIRCULATION CONFLICTS
ON LOOP ROAD
(PLEASANT HILL)

## WALKING TO BART

### How does one know which route to take?

Pedestrian trips to subway stations are most common in downtown or medium-density areas. Pedestrians walking in downtown areas other than Market Street in San Francisco will encounter directional signs at major pedestrian intersections within a two- to three-block radius of the BART stations (Photo 2.5). Some patrons have had difficulty locating Market Street station entrances without the aid of directional signs.

The pedestrian's selection of a route to the station is based on shortest walking distance; avoidance of street crossing delays and steep slopes or steps; safety (e.g., width of a sidewalk, traffic hazards); security (e.g., lighting, visibility, loitering), and amenities (e.g., interesting shops, landscaping). Market and Mission Streets in San Francisco and Shattuck Avenue in Berkeley were each attractively renovated in the vicinity of BART stations. The beautification undertaken in association with BART construction enhances the pedestrian environment.

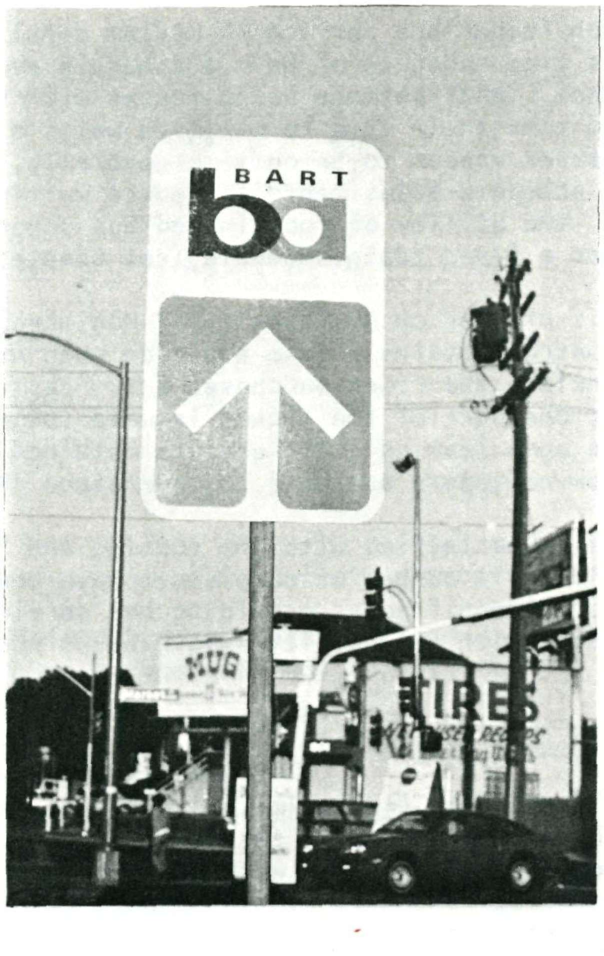


PHOTO 2.5

DIRECTIONAL SIGNS
TO BART STATIONS
ON NEARBY STREETS

The resulting social situation is inherently one of conflict among users, even though most of them -- including the low-income residents -- have legitimate needs and a right to be there. Despite this conflict the Plaza is generally well used by people of all kinds, including tourists. As already noted, crime is not a major problem. However, in future systems some consideration should be given to the potential for such conflicts and related problems. Location rather than design seems to be the issue; in this case it appears that the Plaza provided a new focus for already-existing conflicts in the area, rather than creating new ones.

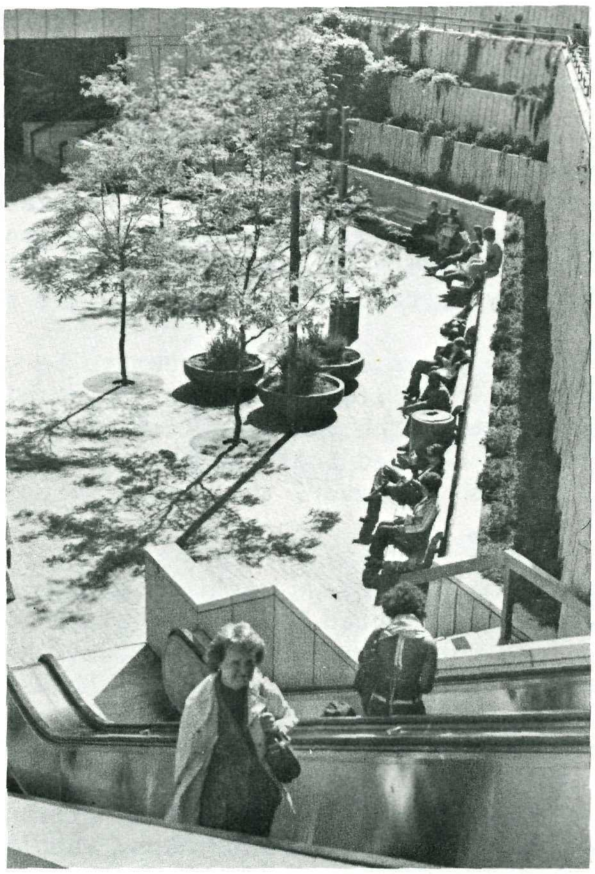


PHOTO 2.6

HALLIDIE
PLAZA
(POWELL STREET)

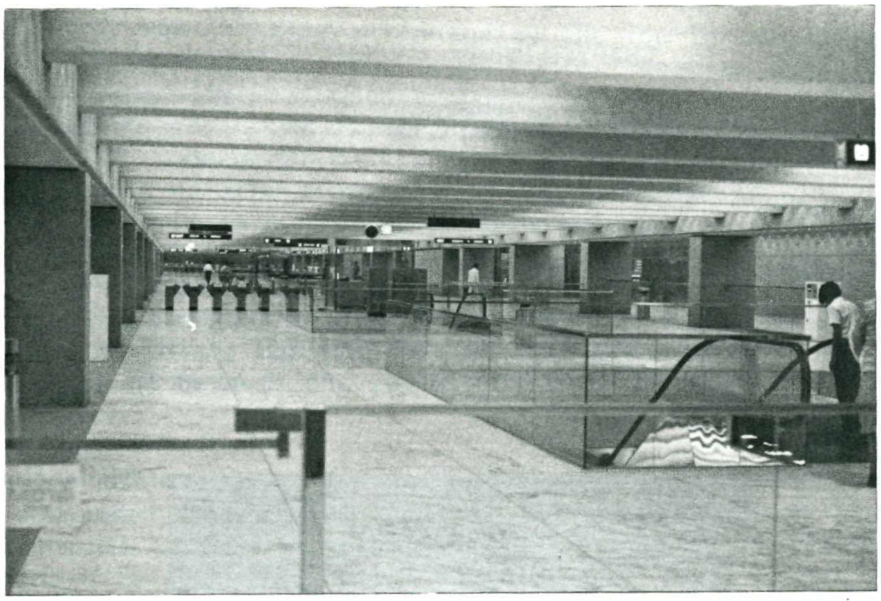


PHOTO 3.1

SUBWAY STATION
CONCOURSE
(EMBARCADERO)

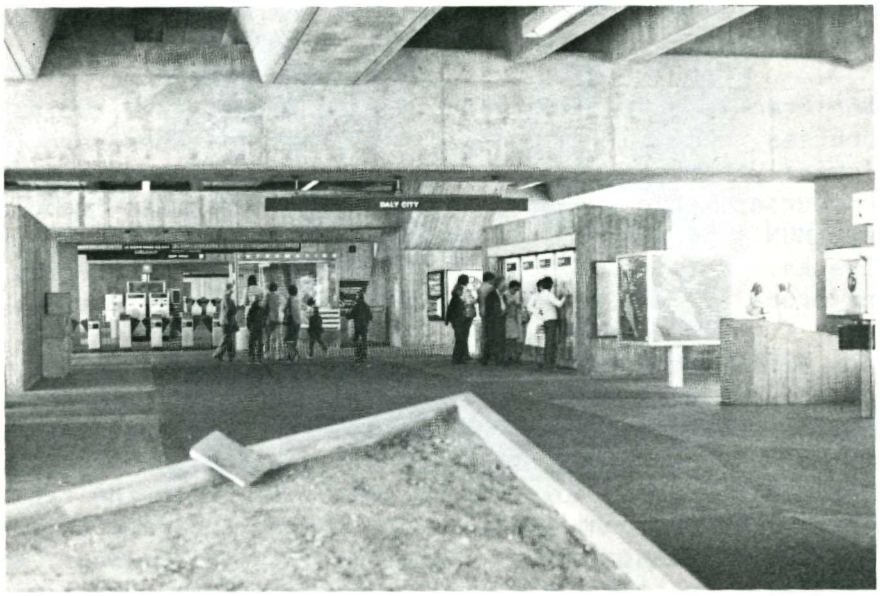


PHOTO 3.2

GROUND LEVEL
CONCOURSE
(DALY CITY)

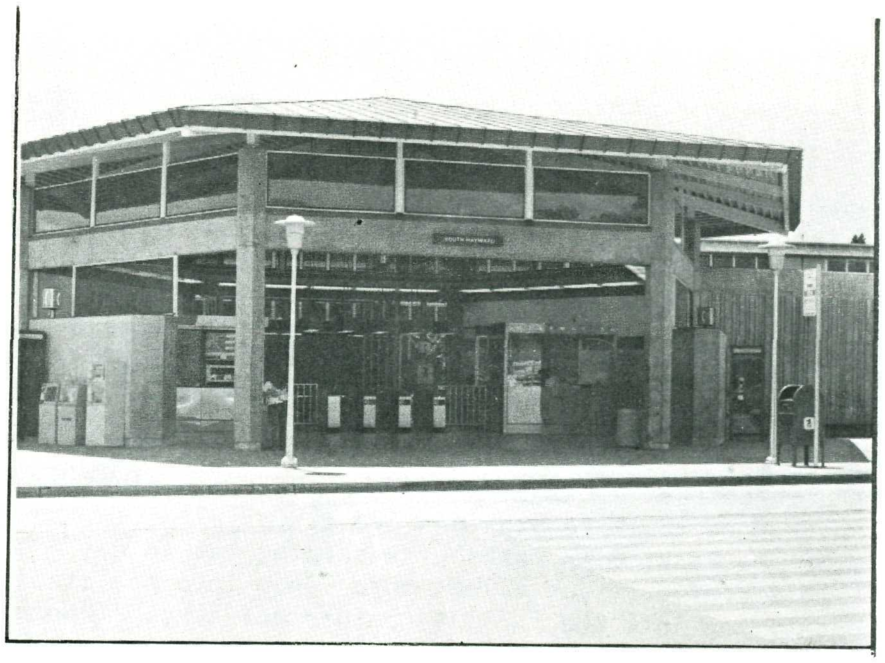


PHOTO 3.3

STATION
ENTRANCE
(SOUTH HAYWARD)

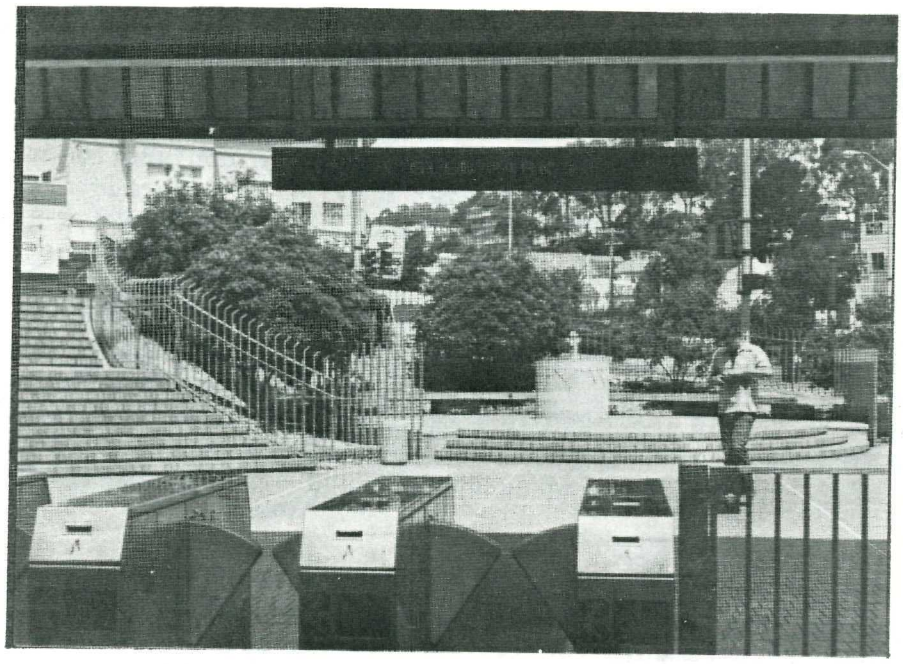


PHOTO 3.4

CONCOURSE
(GLEN PARK)

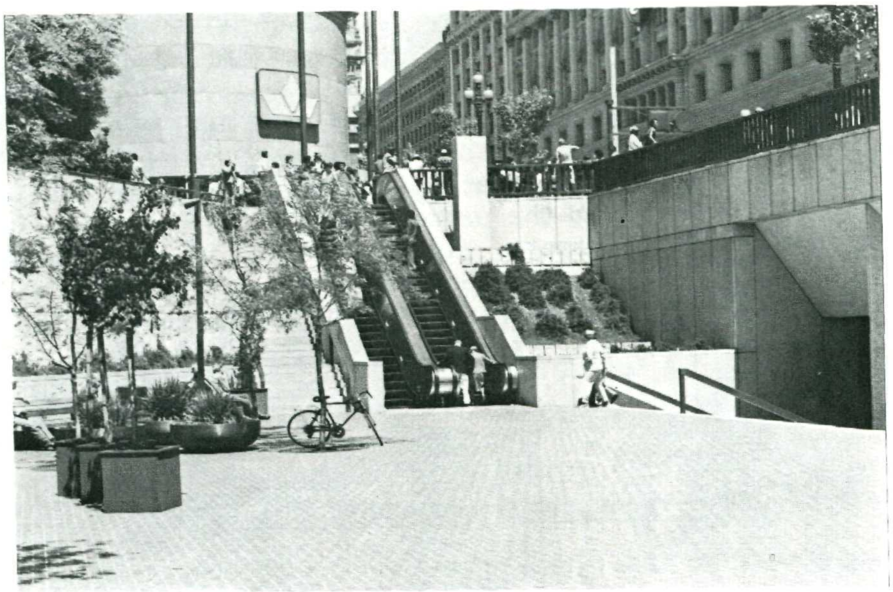


PHOTO 3.5

HALLIDIE PLAZA
(POWELL STREET)

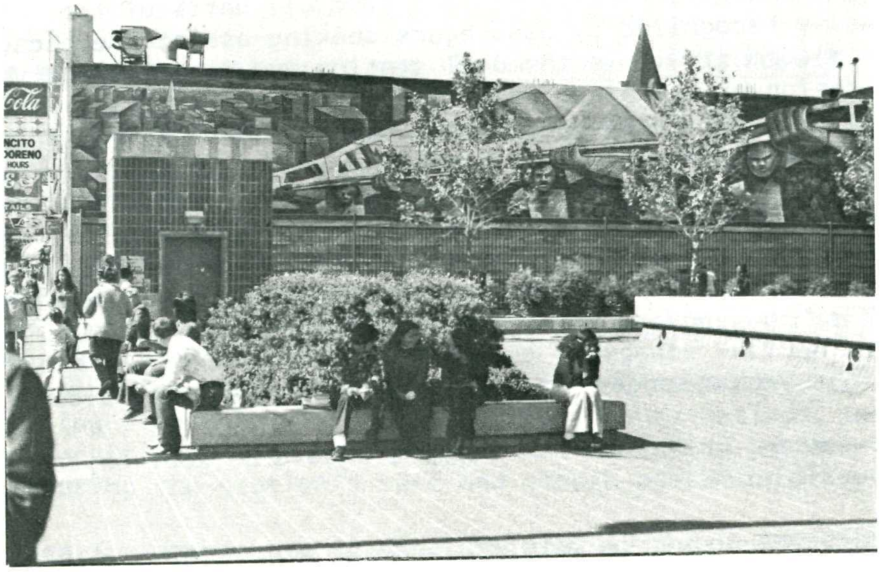


PHOTO 3.6

STREET PLAZA
(24TH AND MISSION)

PHOTO 3.7

STATION AGENT'S
BOOTH
(DALY CITY)

Observation of circulation patterns reveals that passenger movement through the concourse is smooth for the commuter, the primary user of the system. However, infrequent riders surveyed have difficulties in operating machines and making their way to and from trains, especially during crowded rush periods.

Is it easy for a patron to get the information he needs?

There are several sources of system information available in each station, including graphics, brouchres and BART personnel. The station agent is, however, the most important source of information.

Station agents are on duty at every station during operating hours to assist travelers. They have telephone access to Chinese and Spanish-speaking persons at BART headquarters for patrons who cannot speak English between 9 a.m. and 5 p.m. The duties of agents include services such as system information, emergency first aid, assistance to handicapped patrons, expediting flow through the fare gates in busy periods, handling lost and found inquiries and general complaints, admitting patrons to restrooms, and assuring the station's safe and smooth operation in general.

BART station agents are in general friendly and very helpful. Sometimes in busy stations during rush periods especially, it was observed that there were not enough of them (typically one or two) to meet the needs of patrons. In those cases, patrons who needed to use restrooms or elderly/handicapped patrons needing elevators would have to wait while agents dealt primarily with facilitating the fare collection and exit/entry of patrons. Also during their twice-daily break periods, agents working alone in some stations must leave their station unattended for 20 minutes or so.

Station agents interviewed stated that much of their time is taken answering questions about fares, operation of the fare collection equipment, how to get taxis, and other similar matters. Ideally, the brochures and graphs should answer all or most of these questions sufficiently. Station agents can be highly imaginative in their attempts to cope with the public; some even write and post localized system information in an informal manner (Photo 3.8). However, there is no official mechanism to facilitate this. BART patrons surveyed, especially first time users, stated thay utilize station agents for information and assistance more than any other means of system orientation. This was confirmed by the agents.

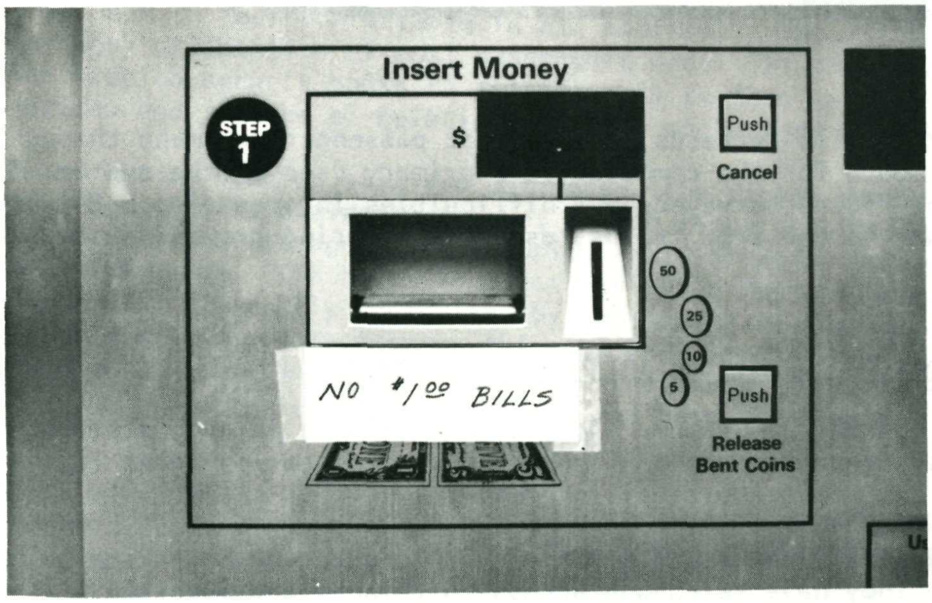


PHOTO 3.8

HANDWRITTEN INFORMATION ON TICKET MACHINE

The brochures are concisely written, giving all the information a patron needs to use the system. "All About BART" is printed in three languages (English, Chinese and Spanish), although only the English version is displayed in most stations (the others are available from the station agent). Also, a booklet called "BART and the Handicapped" is available for handicapped users.

Several graphic devices are used. There are display maps at all stations in the concourse area and often on the platform level. These consist of three system maps:

- The geographic Reference Map showing areas served by BART.
- The Route Map showing BART lines, transfer points and other operational aspects of the system.
- The Local Map which shows the locale around the station, bus, and other transportation connections, and points of interest.

These maps are approximately 4' x 4' in size. At the Powell Street Station (the main tourist-used station) larger versions, approximately 12' x 12', are found at the concourse entrance (Photo 3.9).

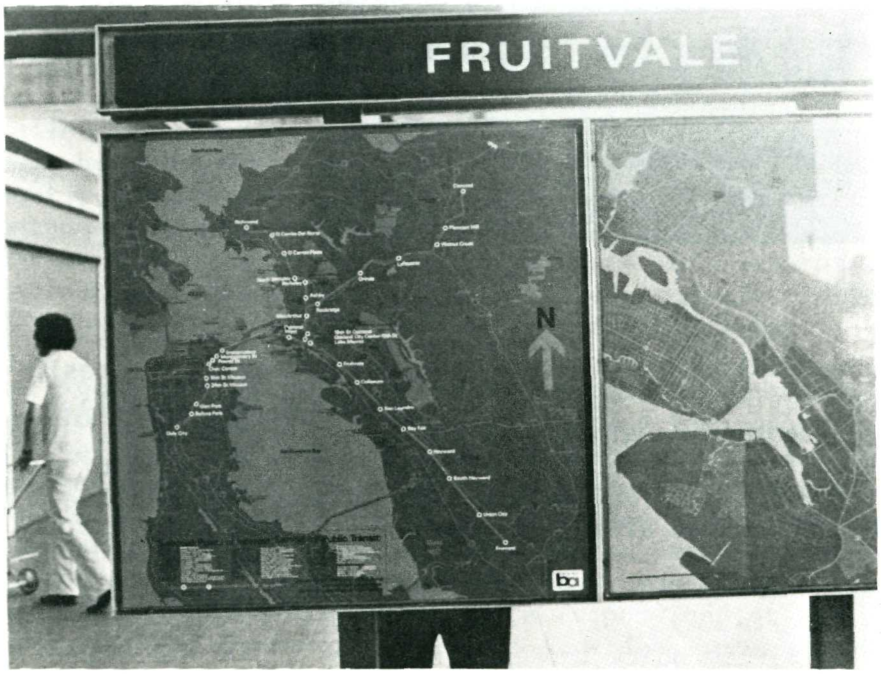
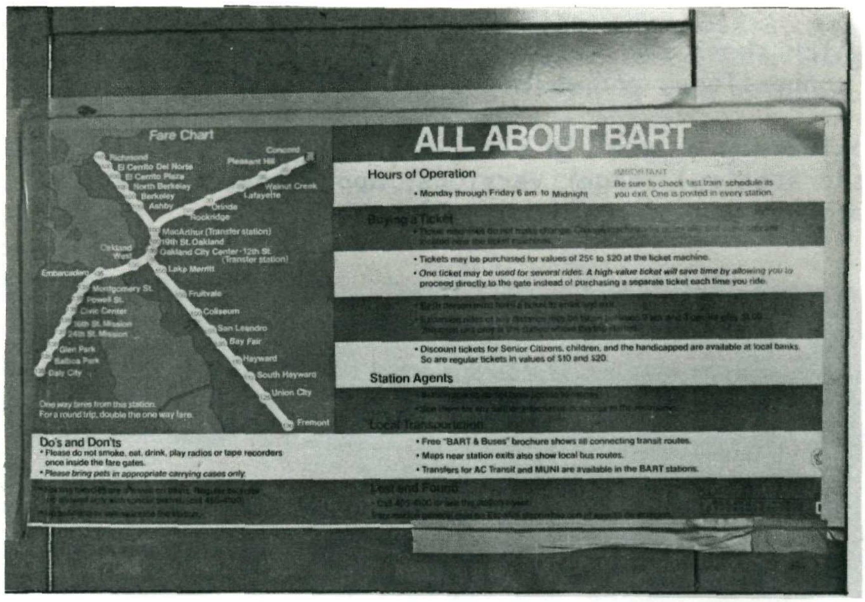


PHOTO 3.9-

MAP DISPLAYS
ON CONCOURSE
(FRUITVALE)

None of the station graphics appear in any language other than English. This hampers many members of San Francisco's large immigrant population as well as non-English-speaking tourists. Internationally understood symbols have been extremely useful in European transit systems in dealing with similar problems.

In addition to the maps there is a four-foot square information display entitled "All About BART" (Photo 3.10), signs on station agents' booths and in other prominent places indicating "last night train schedules" to all destinations, and instructions on ticket and change machines indicating how to use them.



One way fares from this station.
For a round trip, double the one way fare.

• Monday through Friday 6 am to Midnight

Be sure to check 'last train' schedule as you exit. One is posted in every station.

• Tickets may be purchased for values of 25¢ to $20 at the ticket machine.

• One ticket may be used for several rides. A high-value ticket will save time by allowing you to proceed directly to the gate instead of purchasing a separate ticket each time you ride.

• Discount tickets for Senior Citizens, children, and the handicapped are available at local banks. So are regular tickets in values of $10 and $20.

• Please do not smoke, eat, drink, play radios or tape recorders once inside the fare gates.

• Please bring pets in appropriate carrying cases only.

• Free "BART & Buses" brochure shows all connecting transit routes.

• Maps near station exits also show local bus routes.

• Transfers for AC Transit and MUNI are available in the BART stations.

PHOTO 3.10

"ALL ABOUT BART" CHART (GLEN PARK)

Directional Signing is limited. Since the original intent of the basic station layout was to obviate the need for signs as much as possible,[1] both directional and identifying signs were deliberately minimized. They were, however, made uniform throughout the system with the option of adding more if necessary. These signs include BART system maps (back-lighted) at station entrances and concourse directional signing.

## FARE COLLECTION

Is the fare collection system quick and easy to use?

BART's fare collection system is easy to use once the patron is familiar with the procedure, but initail use is often confusing. Reasons include (1) the inherent complexities of distance-varying fares and (2) unclear instructions in use of the system components.

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[1] McCutchen, W.R. "Passenger Design Standards for BART Stations," proceedings of the ASCE Man/Transportation Interface Joint Specialty Conference, Washington, D.C. (Spring, 1972), p. 197-233.

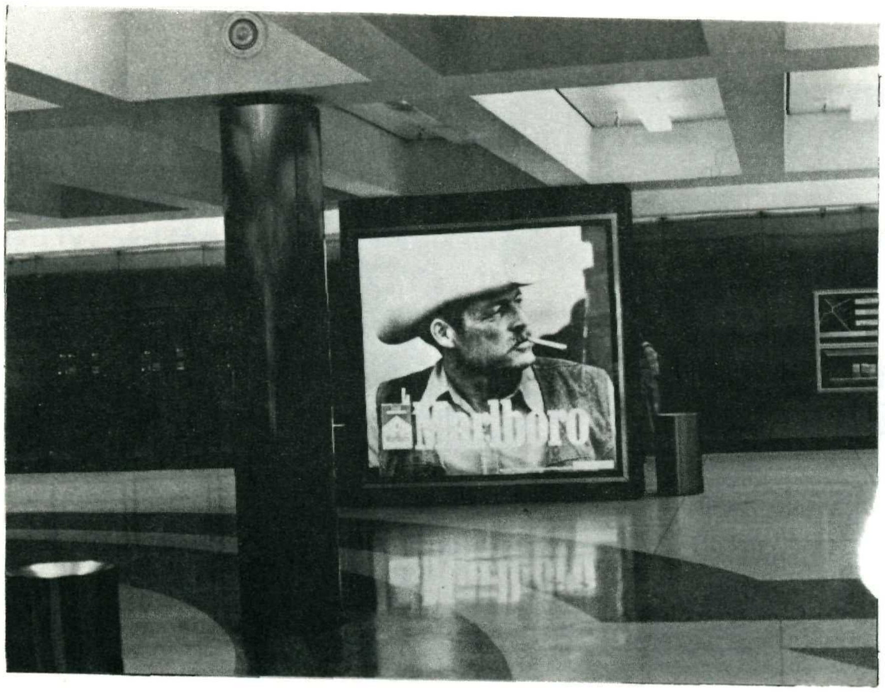

PHOTO 3.13

ADVERTISING
DISPLAY
(POWELL STREET)

Perhaps the most successful lighting effects occur in the Balboa Park and Glen Park subway stations, where the ceiling was left partially open, exposing a portion of the platform and all of the concourse level to natural skylight (Photo 3.14).

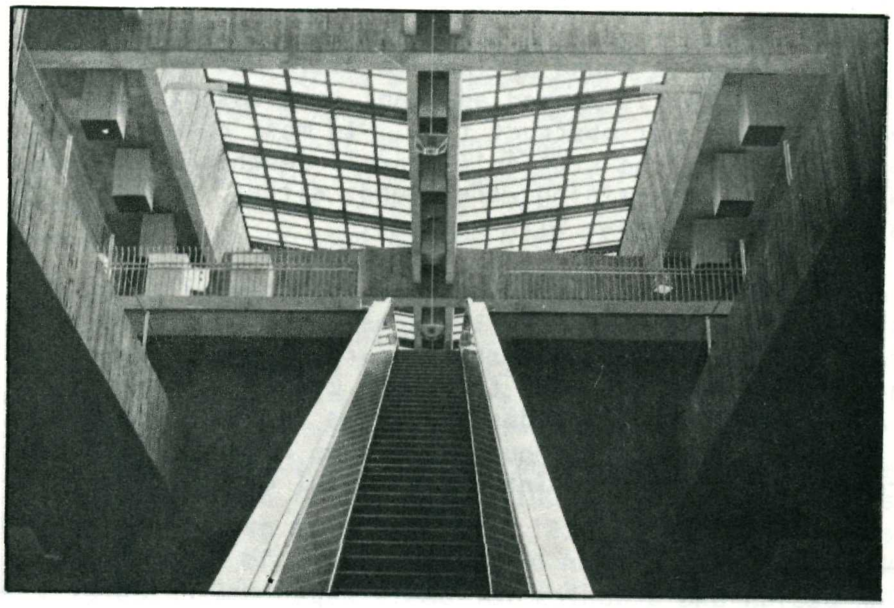

PHOTO 3.14

LOOKING UPWARD
FROM PLATFORM
(GLEN PARK)

PHOTO 4.1

SUBWAY STATION
PLATFORM
(24TH AND MISSION)

PHOTO 4.2

ABOVE GROUND
STATION PLATFORM
(SOUTH HAYWARD)

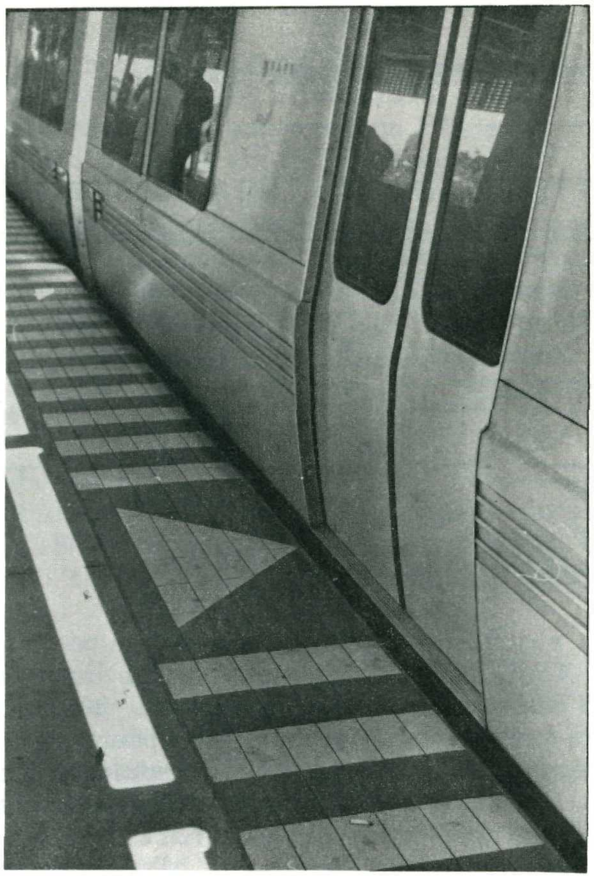

PHOTO 4.4

PLATFORM EDGE MARKING
WITH ARROWS
INDICATING TRAIN
DOOR STOP LOCATIONS
(LAFAYETTE)

is an elliptical crowding pattern created when patrons are unsure of door stops. Interestingly, the pattern associated with exact stops and cross queues sometimes impedes movement along platforms more than the elliptical crowding pattern, especially in restricted areas of platform (along sides of stairs or escalator wells). In regard to the study's observations, it was stated:

> When vehicles stop at the same place time after time, pedestrians have been observed to queue in well ordered lines, two abreast perpendicular to the length of the platform. These lines then tend to wind around following the rear of the platform and tend to interfere with the on-loading traffic. The semi-elliptical queue at the front of the platform appears to be the more common. In this case, loading takes place at the front of the platform, and cross traffic occurs at the rear (Figure 4.1).

### When will the train come?

BART trains run on computer-controlled headways (intervals between trains) rather than on time schedules. However, service is often unreliable, and train delay is one of the major complaints patrons have about the system.

In a recent review of transit patron attitude studies, it was concluded that travel time reliability is an even more important factor to patrons

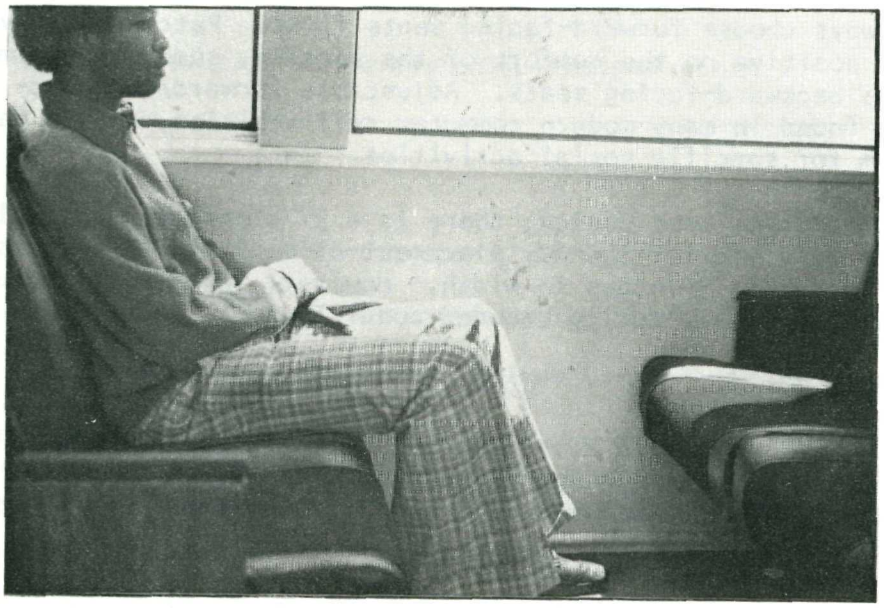

PHOTO 5.5

TYPICAL
SPACIOUS
SEAT

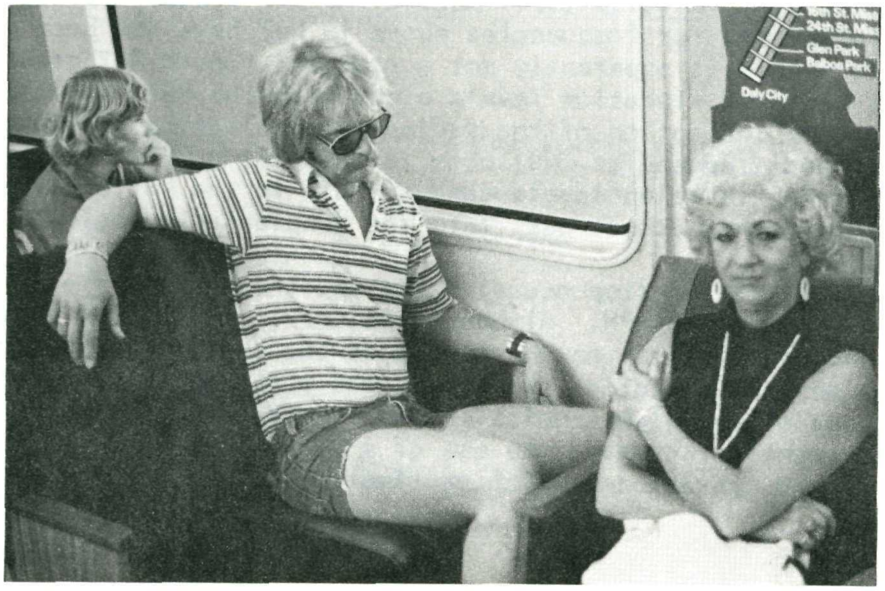

PHOTO 5.6

SEATS WITH
INADEQUATE
LEG ROOM

### Is the lighting system adequate for patrons' needs?

The lighting system is an excellent synthesis of natural and artificial lighting. The basic design considerations were to provide lighting intensity sufficient for comfortable reading without subjecting passengers to direct glare, and to minimize contrast between natural and artificial light when entering and leaving subway stations.[1] In daylight, the 1/4" tinted glass windows provide excellent exterior visibility and glarefree interior illumination. The contrast between daylight and subway illumination was observed to be barely noticeable, while reading and interior lighting met the design recommendations described above. However, it was observed that the wall lights spaced along the Transbay tube, where trains are traveling at high speed, produce an annoying "flashing" effect. BART officials stated that the lighting is necessary to illuminate the tunnel for maintenance and safety reasons, even though it may have a hypnotic effect on the driver.

## ORIENTATION

### Are there informational aids on board trains?

There are four large systems maps in each car centrally located on the wall behind the seats near each door (Photo 5.7).

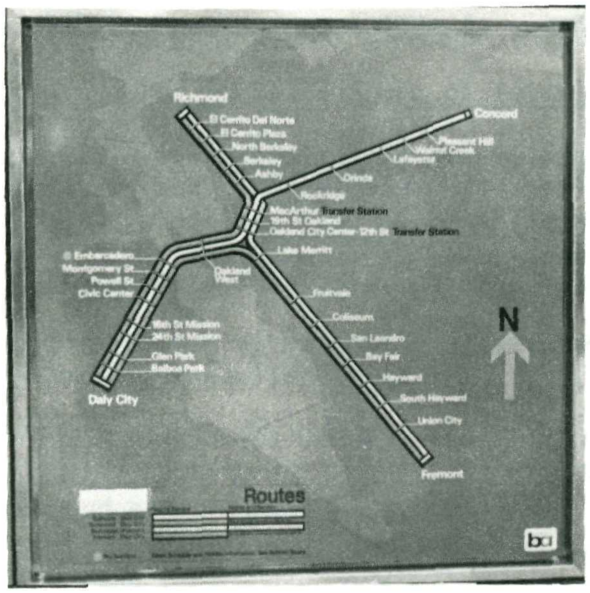

PHOTO 5.7

SYSTEM MAP
ON BOARD
BART TRAINS

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[1] Lawson, op. cit., p. 6 furnishes a more technical description of the lighting system design. For additional details see Conway, op cit., p. 9.

Passing through the fare gates can be done either by lifting the bicycle over them or by processing a ticket and having the station agent open the service gate (as is done for wheelchair patrons). In either case, there is no problem. As long as cyclists are considerate of other patrons, they do not present a nuisance. This is especially true at present since few cyclists use the system.

## TRAINS

Are the trains easy to get bikes on and off, and do the bikes present an obstruction to other patrons?

For the cyclist traveling with a standard bicycle, who is restricted to non-rush hours and to the last car of a train (Photo 8.3), entry or exit is easy and orderly. However, those cyclists with folding bikes, who travel anytime and are not restricted to a specific train location will present the same obstruction to other passengers as do strollers, carriages, and wheelchairs. The only inconvenience to the cyclist is that they must hold onto the bicycles during movement since there are no facilities to secure them. Again, none of these requirements has been found to cause problems.

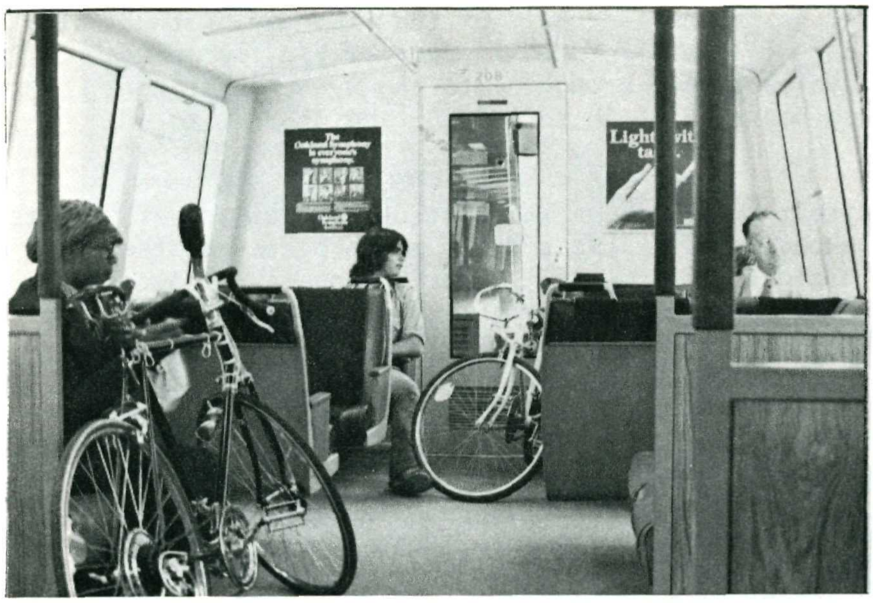

PHOTO .8.3

BICYCLISTS ABOARD BART TRAIN